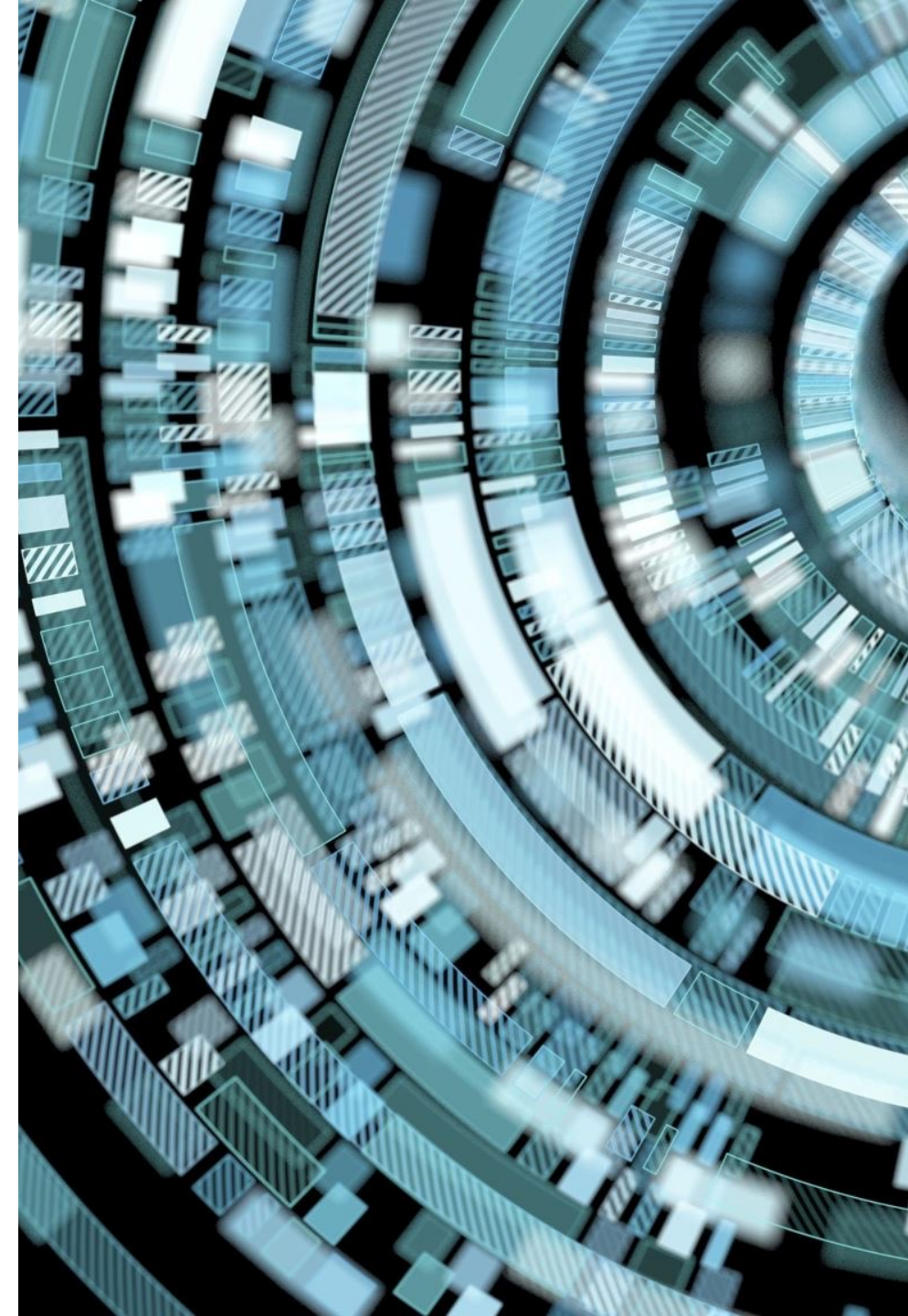


Northern Westchester County Wireless Telecommunications Infrastructure Master Plan

Town of Bedford

February 15, 2022

CityScape
CONSULTANTS, INC.



Northern Westchester County Wireless Tasks and Deliverables

Preliminary Research



Project Initiation Meeting



Infrastructure Assessments



Inventory Catalog



Engineering Mapping Analysis



Regulatory Review and Regulations

Potential Use of Public Property

Draft and Final Master Plan

Wireless Telecommunications History



1G



2G & 3G



4G & 5G Enabled

- 1G service provided voice calls only.
- 2G service included voice, texting and data.
- 3G service offered in early 2000's improved data speeds (Providers retiring 1-3G CDMA in 2022).
- iPhone in 2007 offers thousands of applications and introduces smart phone technology.
- 4G service on AWS and LTE began around 2010 and increased data speeds; included new 700 and 2100 MHz frequencies (smaller handsets, Internet access, longer battery life).
- 5G service increases wireless bandwidth for faster transfer of data, Internet of Things (IoT).

Quick Facts:

- Over 49% of U.S. households have “cut the cord” and are wireless only
- 80% of an estimated 240 million 9-1-1 calls are made from wireless devices
- 45 million Americans use mobile phones as their primary Internet access device
- 2.4 million students connected
- Smart houses, smart cars, smart industry
- More use of data intensive applications such as Facetime, Internet, Streaming Music and HD Movies, Social Media, etc



76%

of travelers say a mobile phone is the most important trip accessory.



85%

of photos taken in 2017 were captured on a smartphone



330%

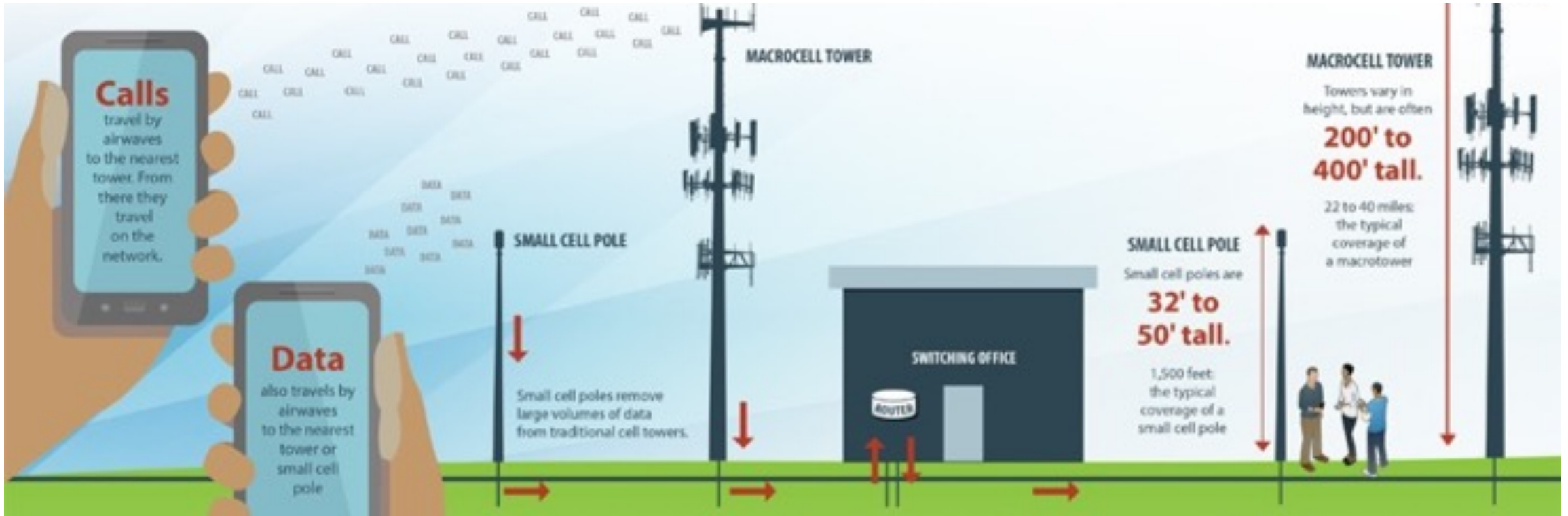
growth in health & fitness apps over the last three years.



31B

connected devices predicted by 2023.

Source: CTIA Wireless Quick Facts, 2019, 2020



Wireless Network Planning/Mapping

MACRO AND SMALL WIRELESS FACILITIES FOR SEAMLESS CONNECTIVITY



Site B6B



Site B9



Site B11



Site B12A



Site B12D

Bedford Macro Tower Sites



Site S7 Macrocell Tower
Concealed



Site P1 Macrocell Tower
Concealed



Site M1 Macrocell Base Station
Non-Concealed



Site Y2 Macrocell Base Station
Concealed

Macrocell Facility Sites In NWC



Site S11



Site B7



Site B14

Bedford Base Station Sites



Small Wireless Facility Sites

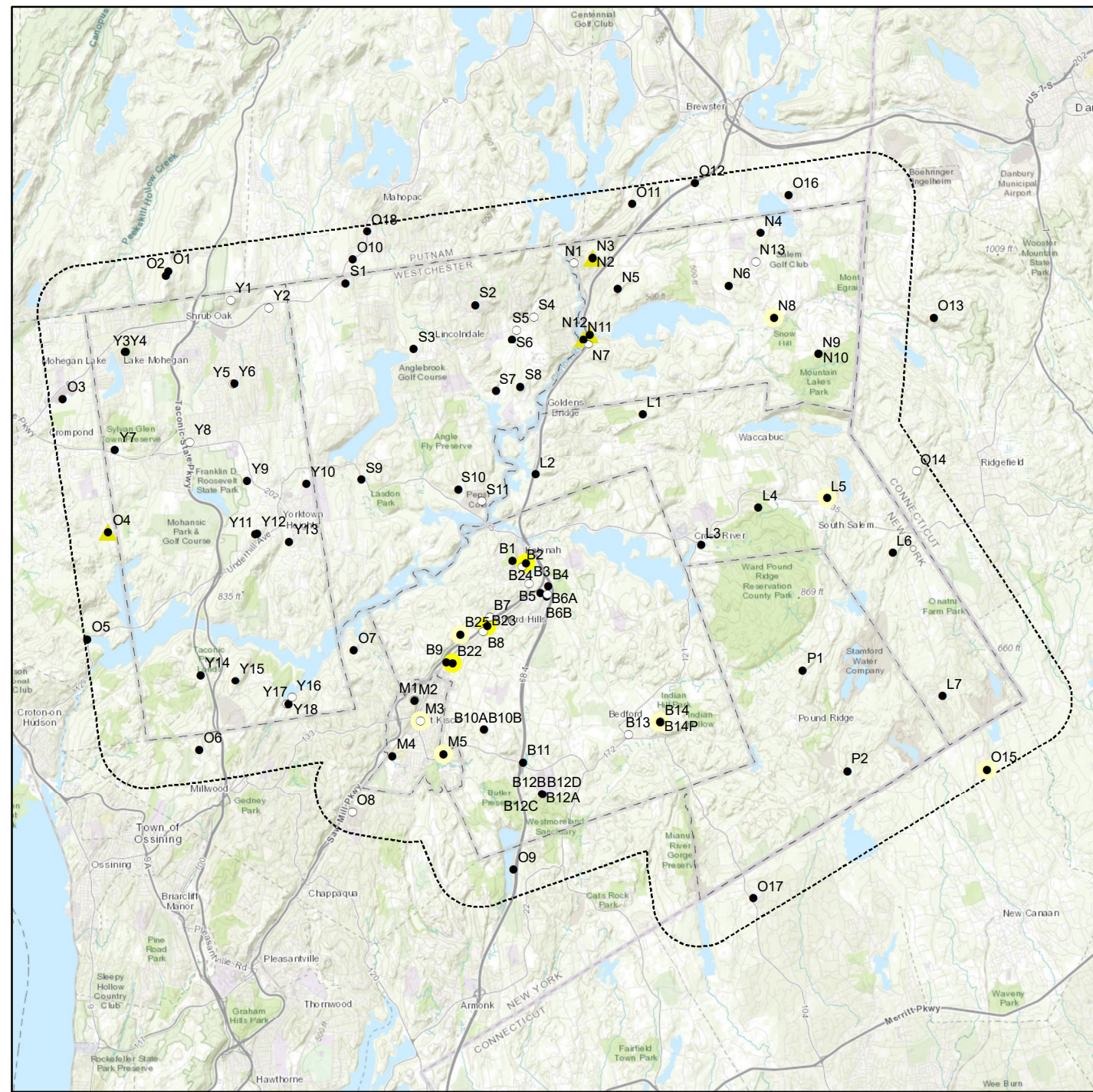
A black pushpin is pinned to a blue map grid. The grid consists of a network of lines, with a prominent set of lines radiating from the point where the pushpin is located. The word "Mapping" is written in white text across the center of the image, with a horizontal line underneath it.

Mapping

Northern Westchester County Inventory

- Town of Bedford: 21
- Town of Lewisboro: 7
- Town/Village of Mount Kisco: 5
- Town of North Salem: 13
- Town of Pound Ridge: 2
- Town of Somers: 11
- Town of Yorktown: 18
- One-Mile Perimeter: 18

(95) Total Wireless Facilities



Inventory by Structure Type

Towers in Bedford (17)

- 12 Existing
- 4 Approved but not yet built
- 1 Inquiry

Towers in one-mile perimeter (8)

- 7 Existing
- 1 Proposed and under review

Towers outside study area (3)

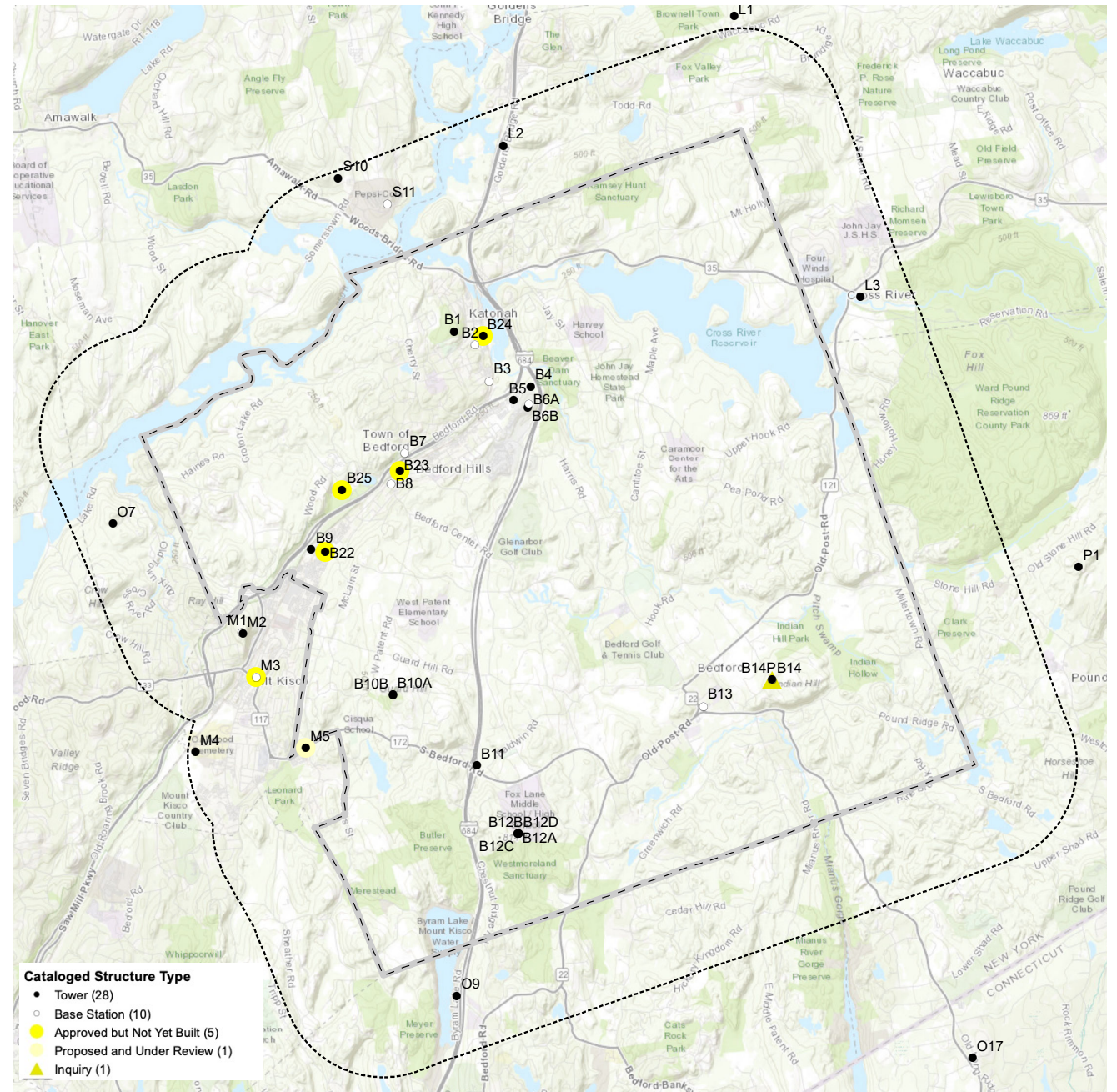
Base Stations in Bedford (7)

- 7 Existing

Base Stations in one-mile perimeter (3)

- 2 Existing
- 1 Approved but not yet built

38 Towers and Base Stations



Inventory by PWSF Antenna Type

Macro facilities in Bedford (7)

- 5 Existing
- 1 Approved but not yet built
- 1 Inquiry

Macro facilities in one-mile perimeter (10)

- 8 Existing
- 1 Approved but not yet built
- 1 Proposed and under review

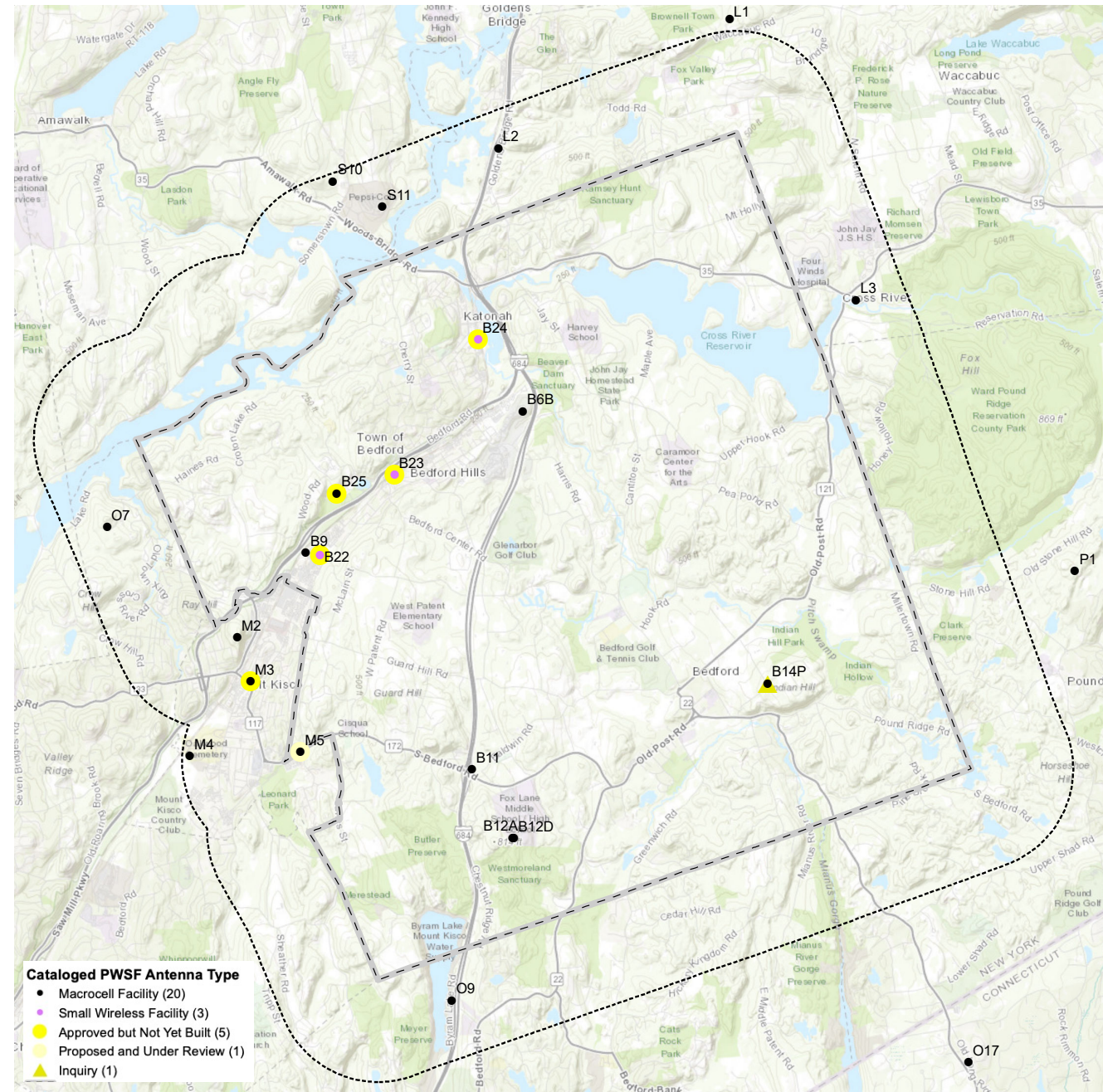
Macro facilities outside study area (3)

- 3 Existing

Small wireless facilities in Bedford (3)

- 3 Approved but not yet built

23 PWSF Sites



Inventory by All Antenna Type

Macro facilities in Bedford Existing (5)

Macro facilities in one-mile perimeter (8)

- 6 Existing; 1 Approved but not yet built; 1 Proposed and under review

Macro facilities outside study area Existing (2)

Small wireless facilities in Bedford (3)

- 3 Approved but not yet built

Public safety facilities (13)

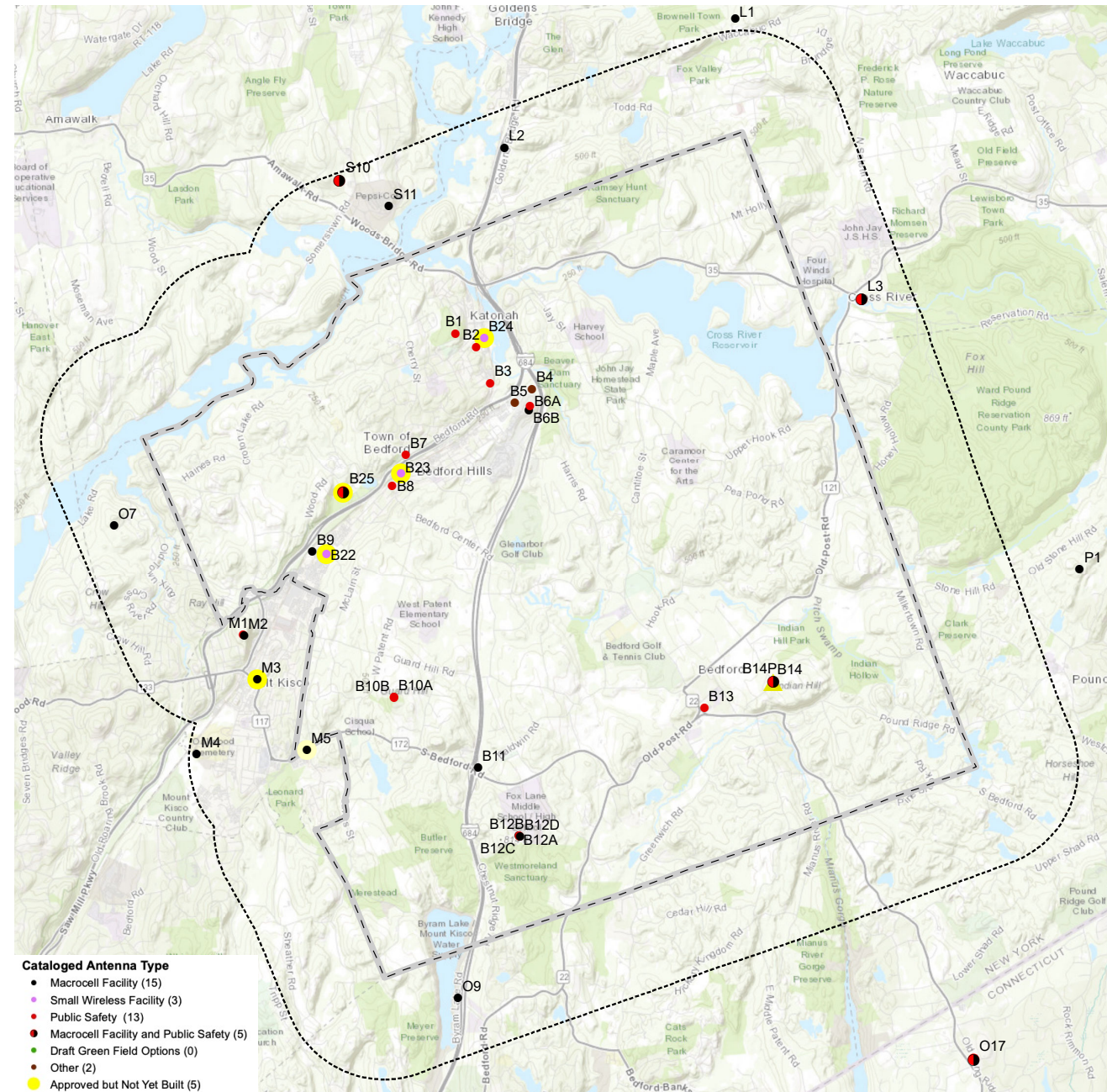
- 12 Existing in Bedford; 1 Existing in 1-mile

Public safety and Macro Facilities (5)

- 1 Approved but not yet built & 1 Inquiry in Bedford
- 2 Existing in 1-mile; 1 Existing outside study

Other facilities in Bedford Existing (2)

38 Sites



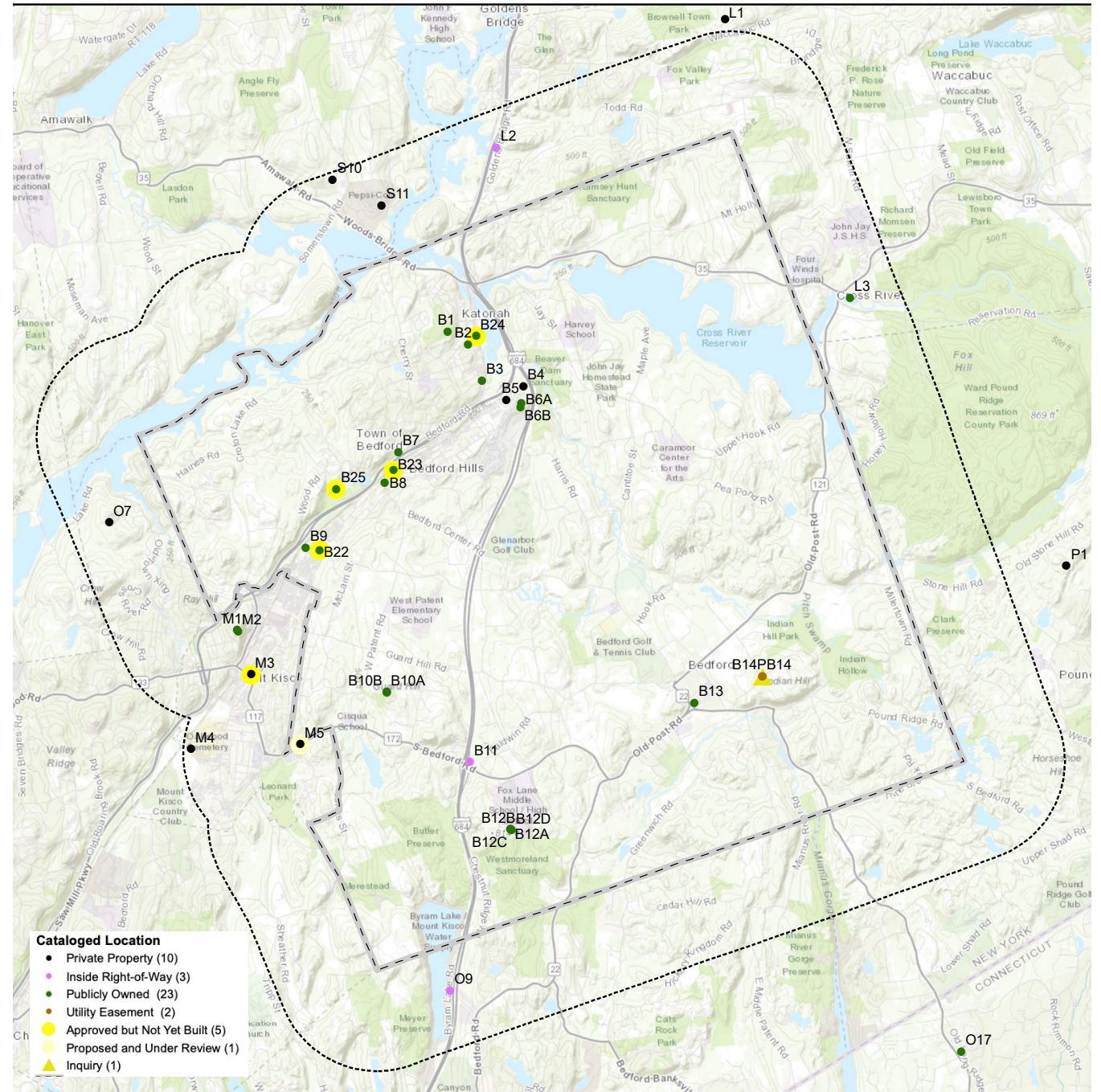
38 Sites

- 2 Existing in Bedford
- 4 Existing in one-mile perimeter
- 1 Approved but not yet built
- 1 Proposed and under review in one-mile perimeter
- 2 Existing outside study area

- 3 Approved but not yet built in Bedford

- 15 Existing in Bedford
- 4 Approved but not yet built in Bedford
- 3 Existing in one-mile perimeter
- 1 Existing outside study area

- 1 Existing in Bedford
- 1 Inquiry in Bedford



Inventory by Design Type

Concealed (6)

- 3 Approved but not yet built in Bedford
- 2 Existing in one-mile perimeter
- 1 Existing outside study area

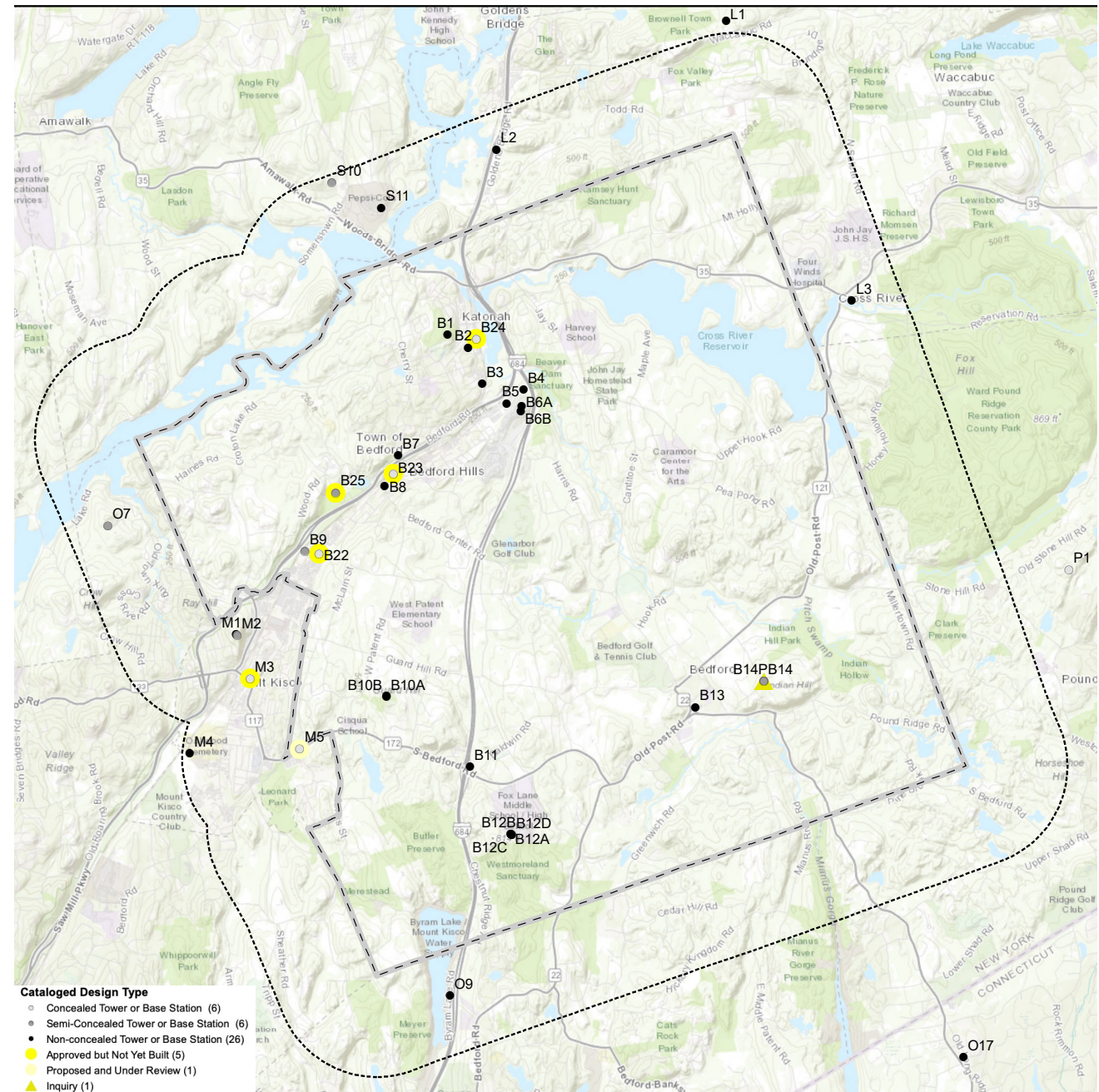
Semi-Concealed (6)

- 1 Existing in Bedford
- 1 Approved but not yet built in Bedford
- 1 Inquiry in Bedford
- 3 Existing in one-mile perimeter

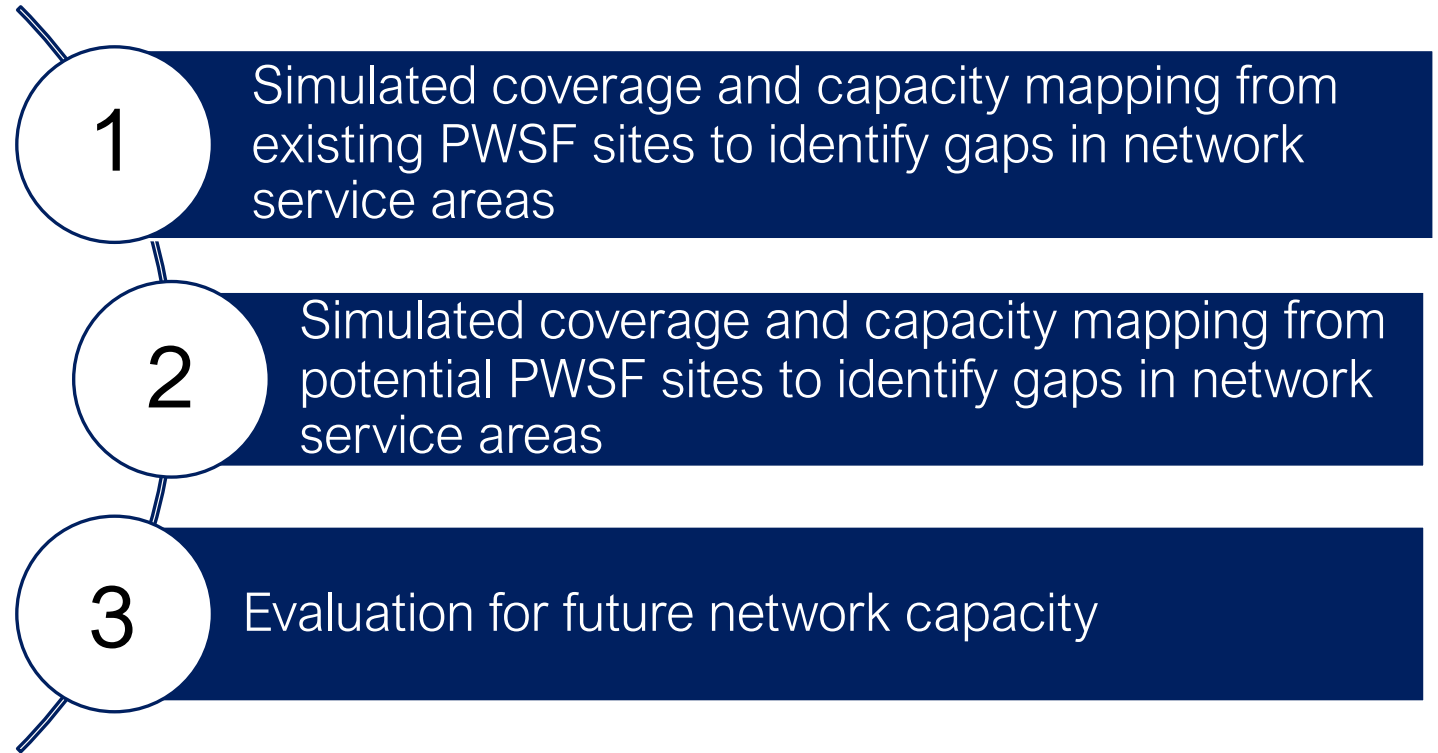
Non-Concealed (26)

- 18 Existing in Bedford
- 6 Existing in one-mile perimeter
- 2 Existing Outside study area

38 Sites



Simulated Propagation Coverage Maps



Coverage Map For A Single Provider

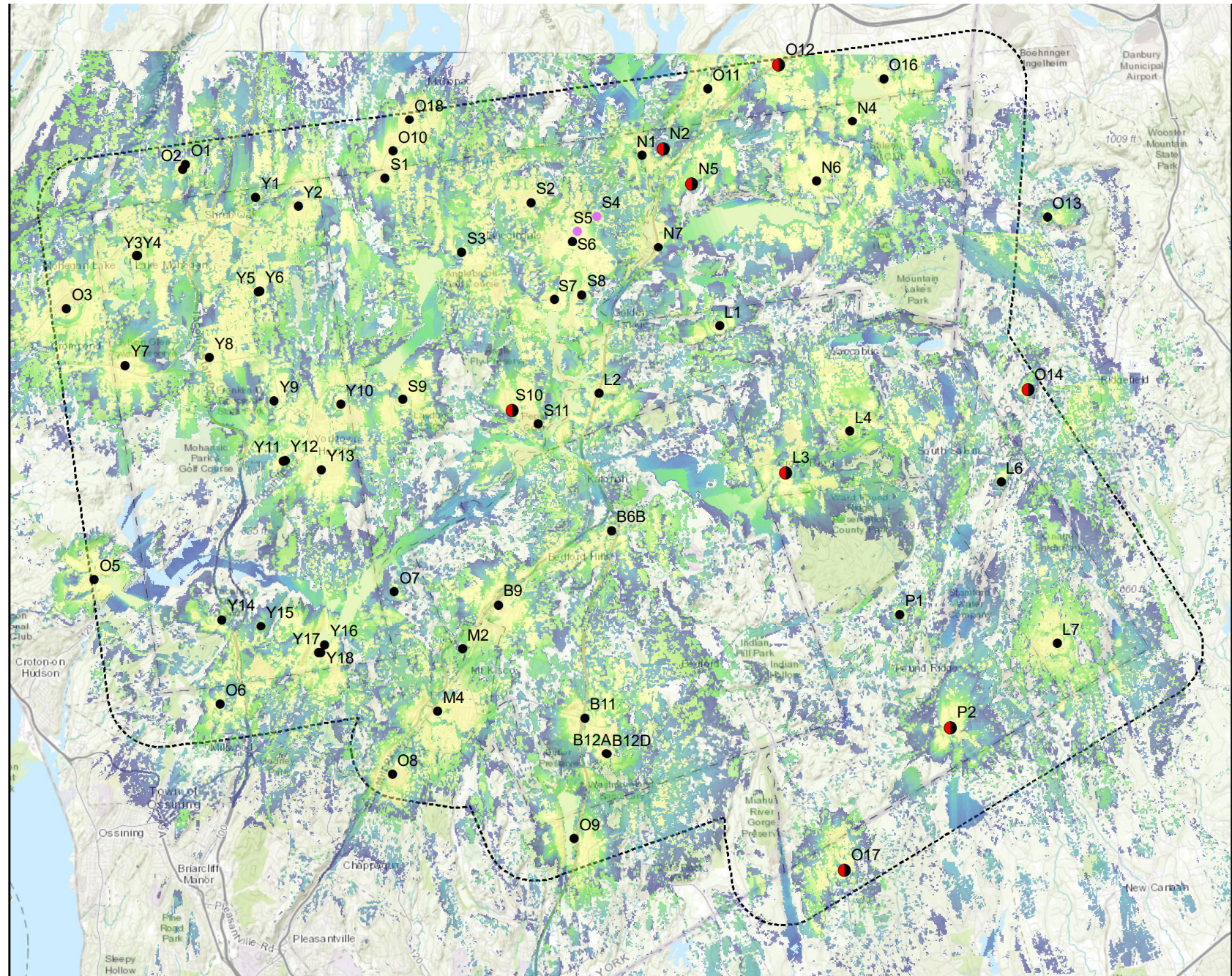
- High frequency coverage map
- Assumes same provider at each site
- Level of propagation signal strength is shown through the gradation of colors from yellow to blue or no color

→ **Yellow** – superior; strong enough to operate within most buildings

→ **Green** – average; strong enough to operate in vehicle but not inside most buildings

→ **Blue** – acceptable; strong enough to operate outside but not in most vehicles or buildings

→ **No color** – poor; no service or dropped calls; gaps where new sites will be needed



Coverage Map Bedford Study Area

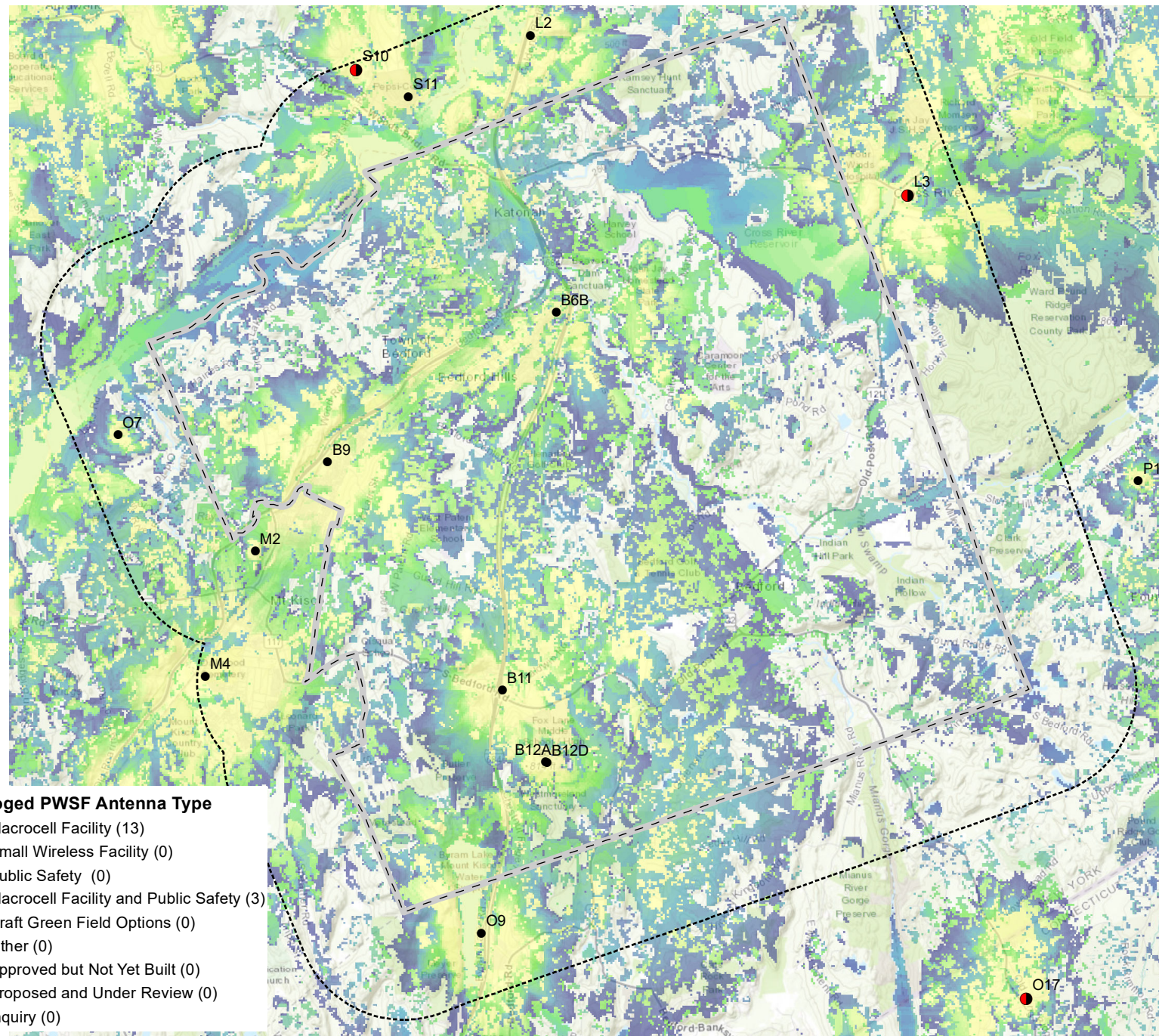
Site Numbers in Study Area

- B6B
- B9
- B11
- B12A
- B12D
- S10
- S11
- L2
- L3
- M2
- M4
- O7
- O9
- L1
- P1
- O17

16 Sites

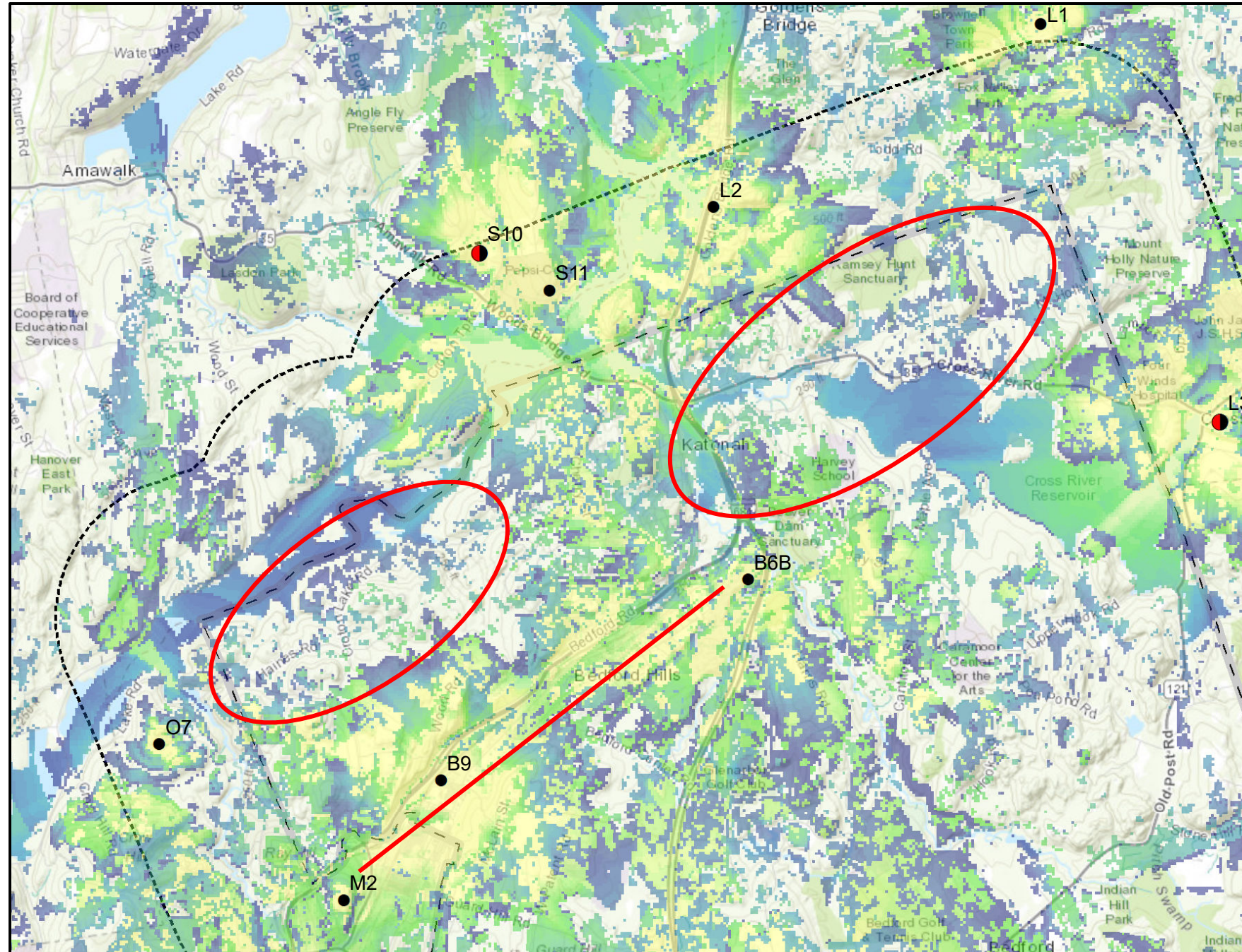
Cataloged PWSF Antenna Type

- Macrocell Facility (13)
- Small Wireless Facility (0)
- Public Safety (0)
- Macrocell Facility and Public Safety (3)
- Draft Green Field Options (0)
- Other (0)
- Approved but Not Yet Built (0)
- Proposed and Under Review (0)
- ▲ Inquiry (0)



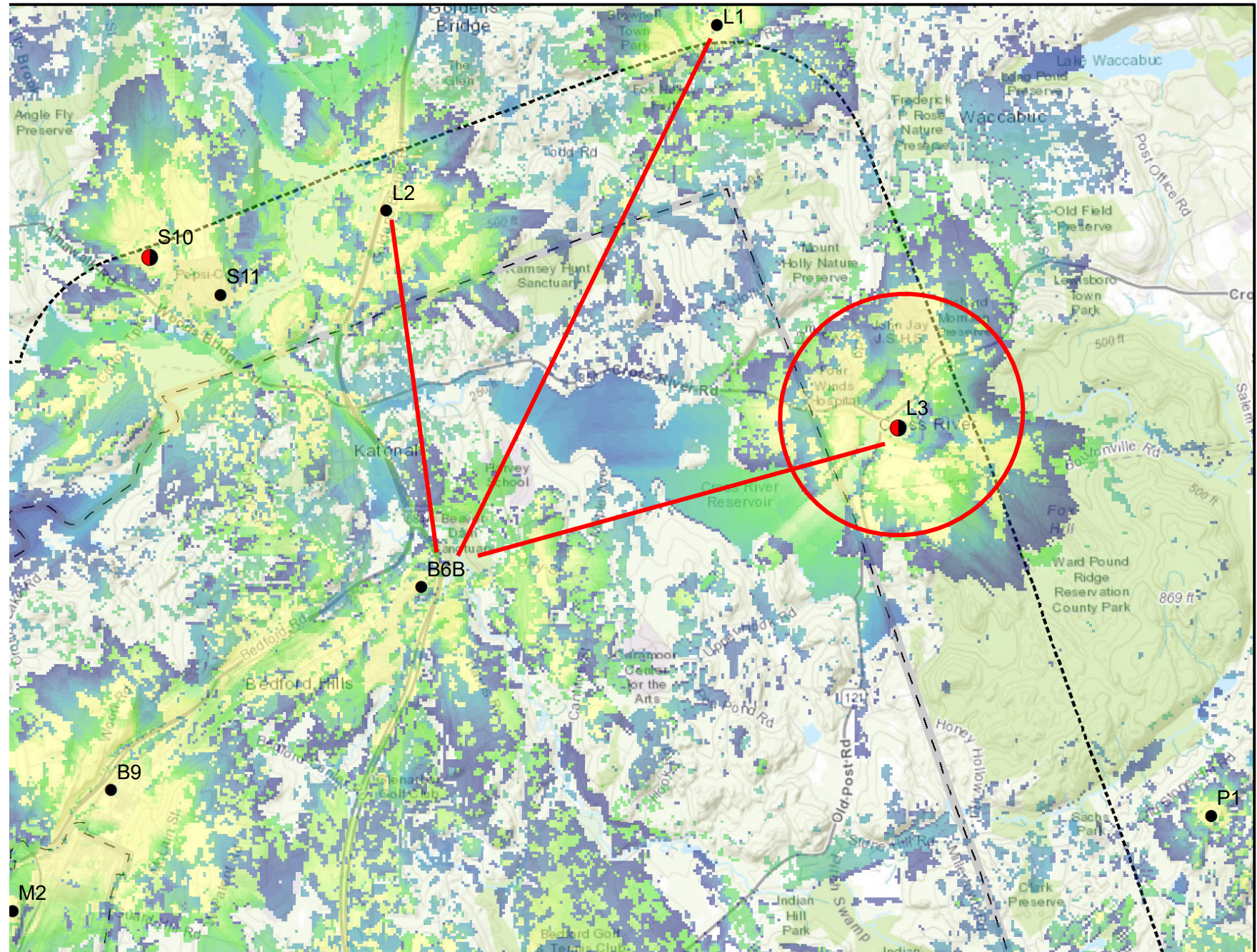
Coverage Map For All PWSF Sites

- B6B and B9 in the northwest part of town boundary has poor handoff to S10, S11, L2, and O7. Many gaps in services in this area.
- M2, B9 and B6B provide continuous coverage along Saw Mill Parkway from western Town line to Bedford Hills
- Katonah spotty coverage due to topography distances between sites



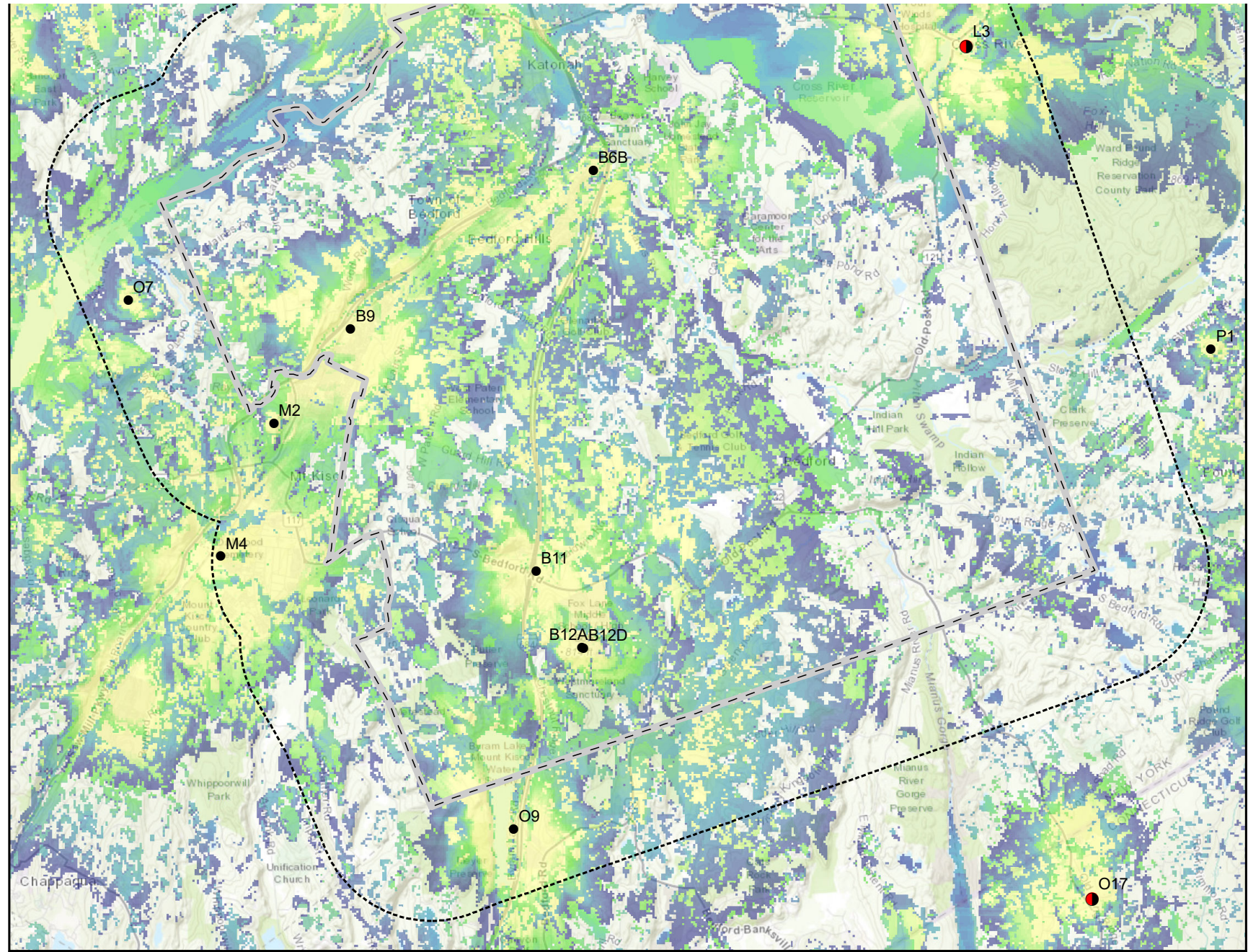
Coverage Map For All PWSF Sites

- L3 is providing coverage along the eastern boundary line north of Old Post Road
- Distance between **B6B** and **L1**, **L2** and **B6B** and **L3** is too great for adequate handoff.
- **Cross River Reservoir** is showing coverage due to the way water **refracts** radio frequency signals.

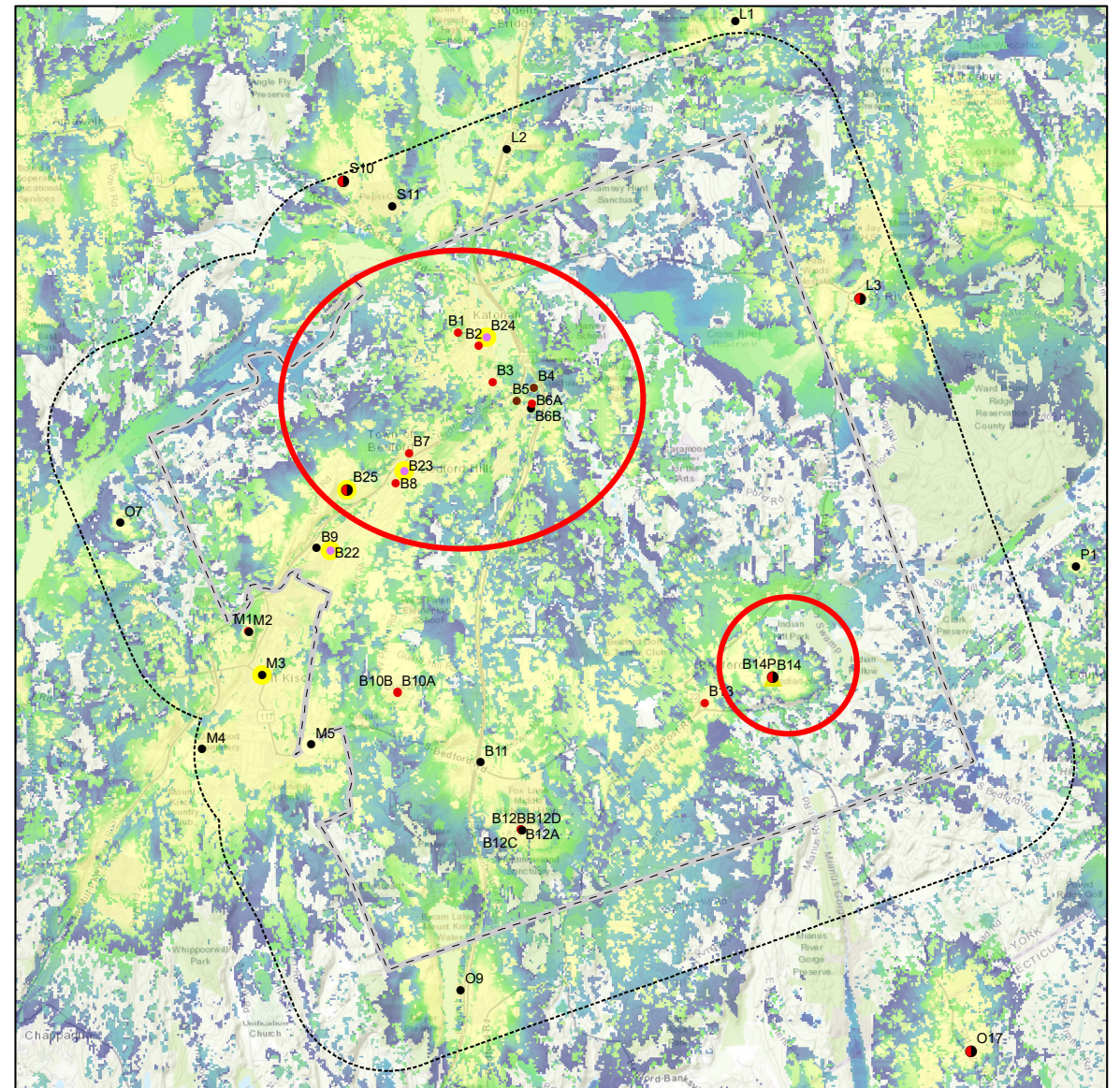
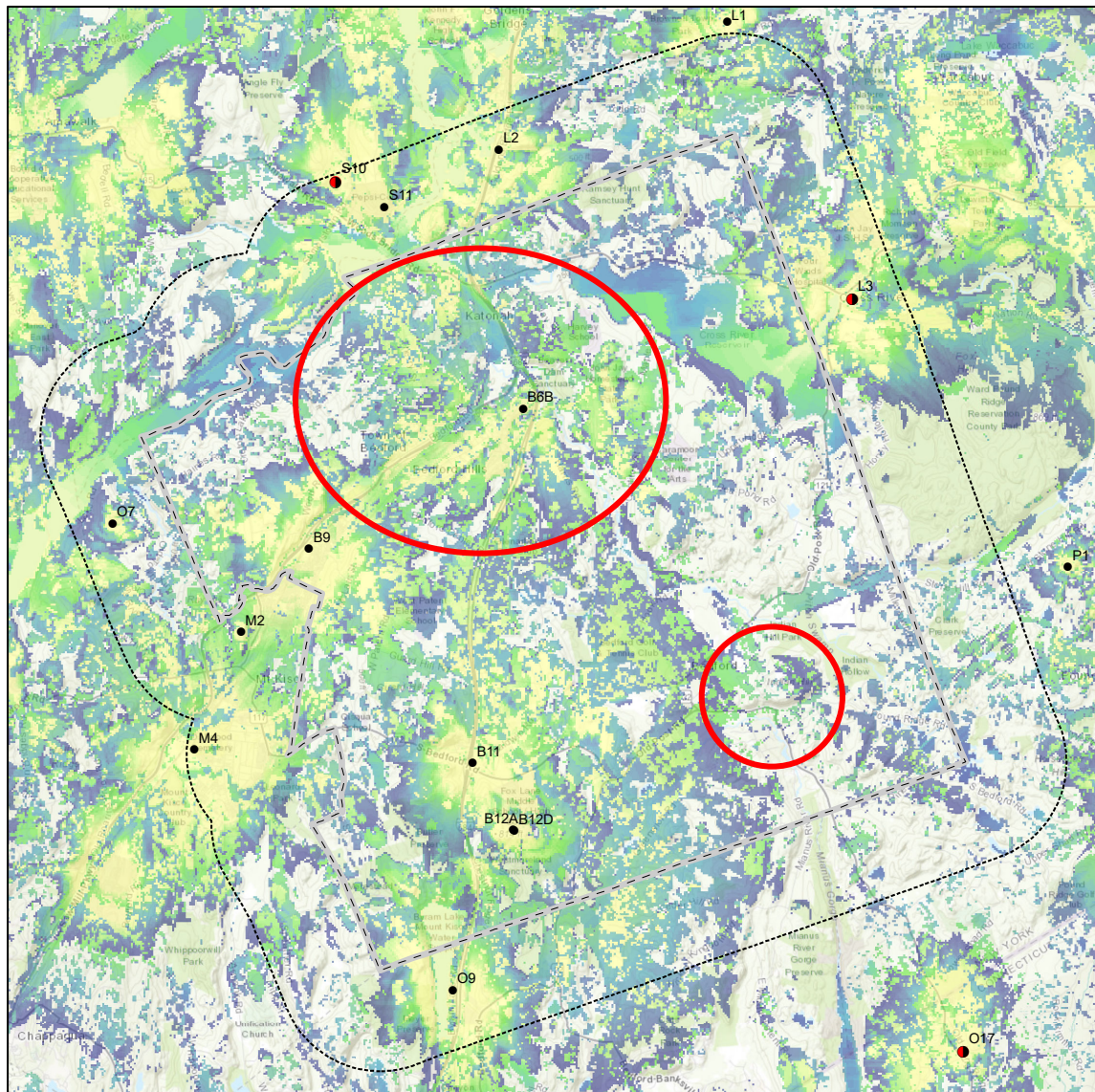


Coverage Map For All PWSF Sites

- B11, B12A and B12D have no sites for handoff to the east
- B11, B12A and B12D are too far from B9, M2 and M4 for contiguous handoff
- Terrain issues:
 - Ground elevation B11 approximate AGL 448' with tower @ 150' = 598'
 - Peak of 806' south of Charles Road
 - Ground elevation B12/B12 B approximate AGL 775'-780; with tower @ 50' = 785'
 - 814' west of sites

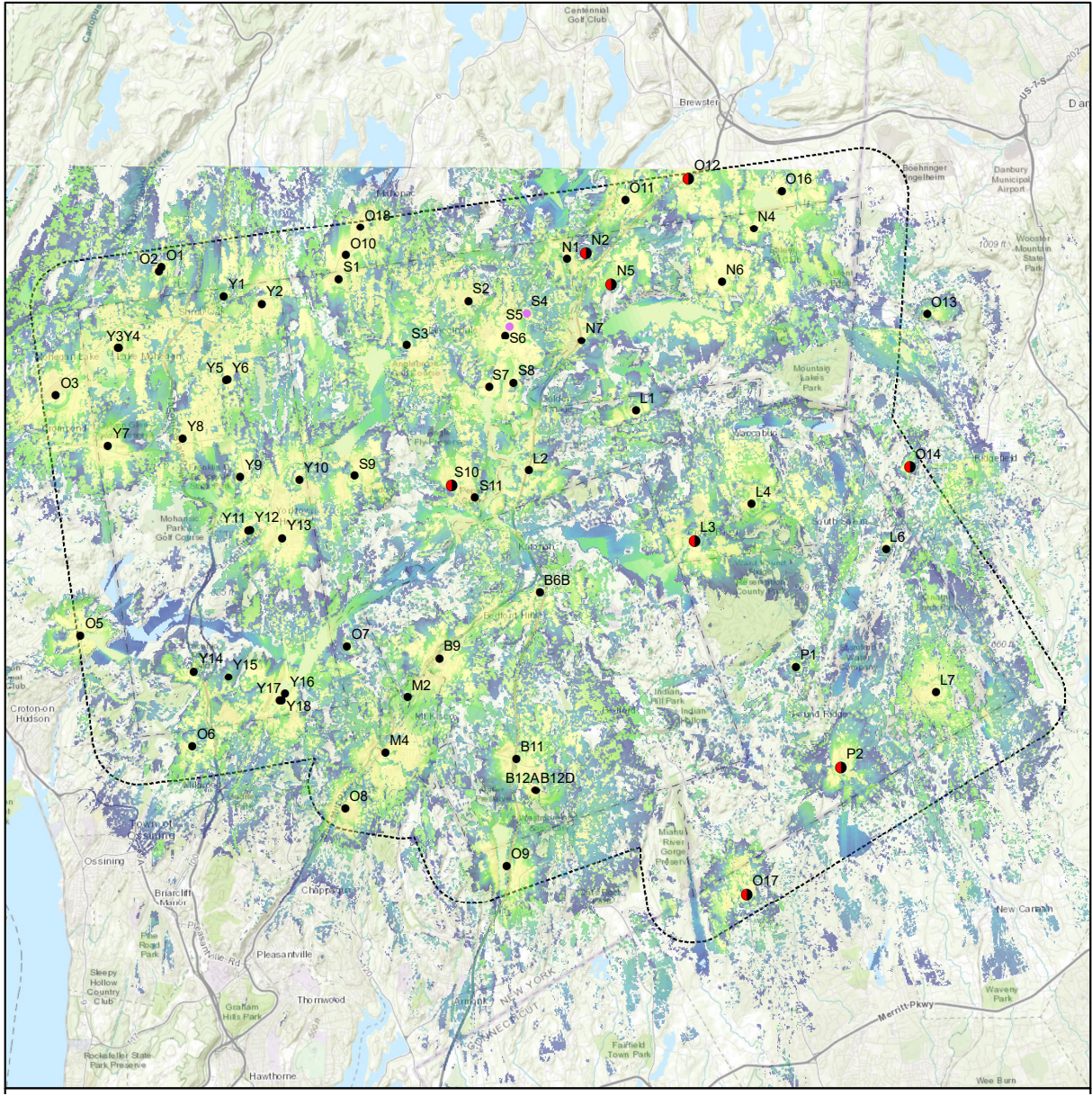
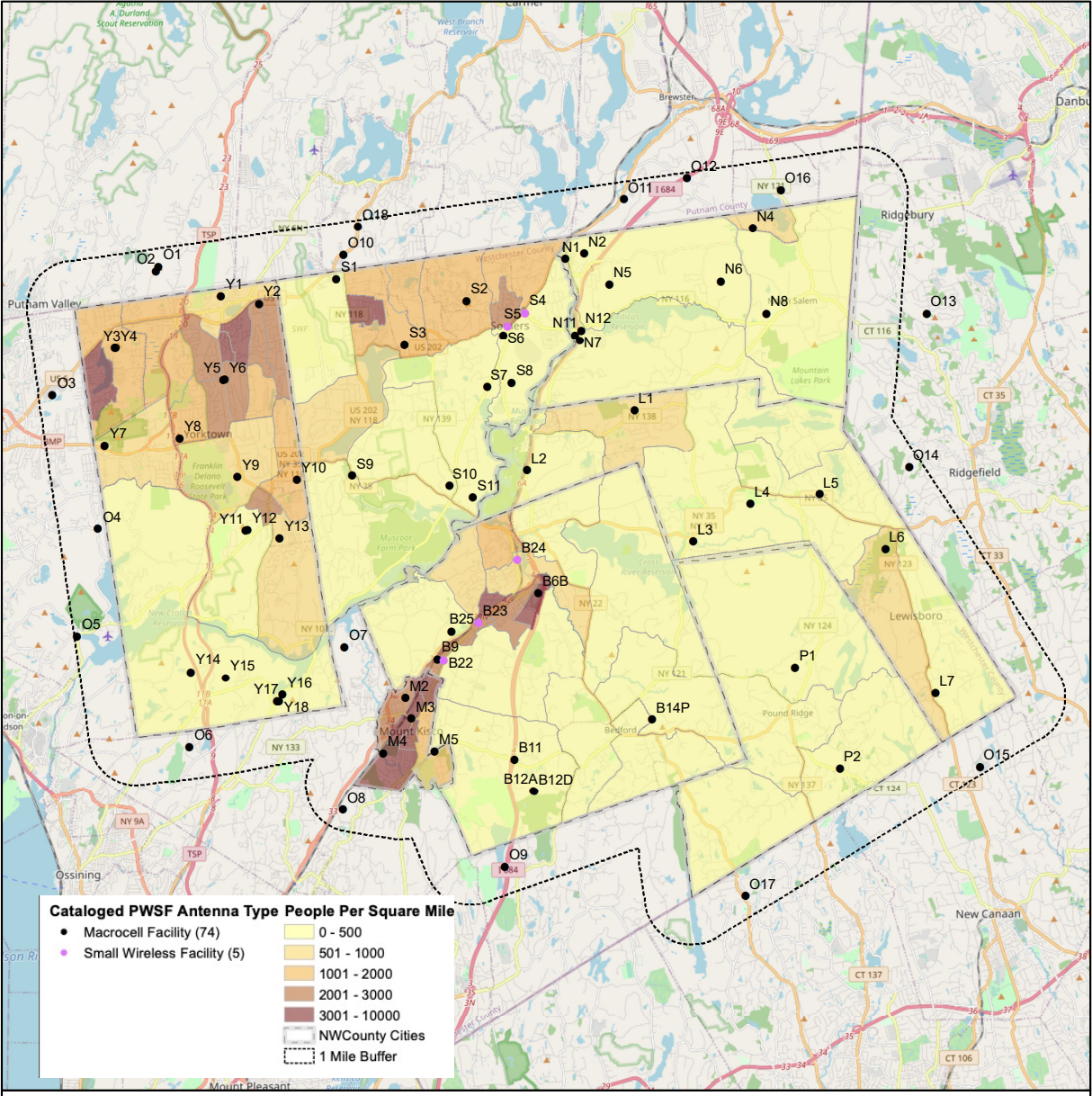


Coverage Comparisons Between Existing and Potential PWSF Sites



- Macro site B25 and Small Cell Sites B22, B23 and B24 will be a considerable improvement in coverage to the surrounding area
 - Adding Inquiry site B14P (macro) improves coverage in the vicinity

Coverage Gaps in County Compared to People Per Square Mile



More PWSF's In Higher Density Areas and Along Major Traffic Corridors

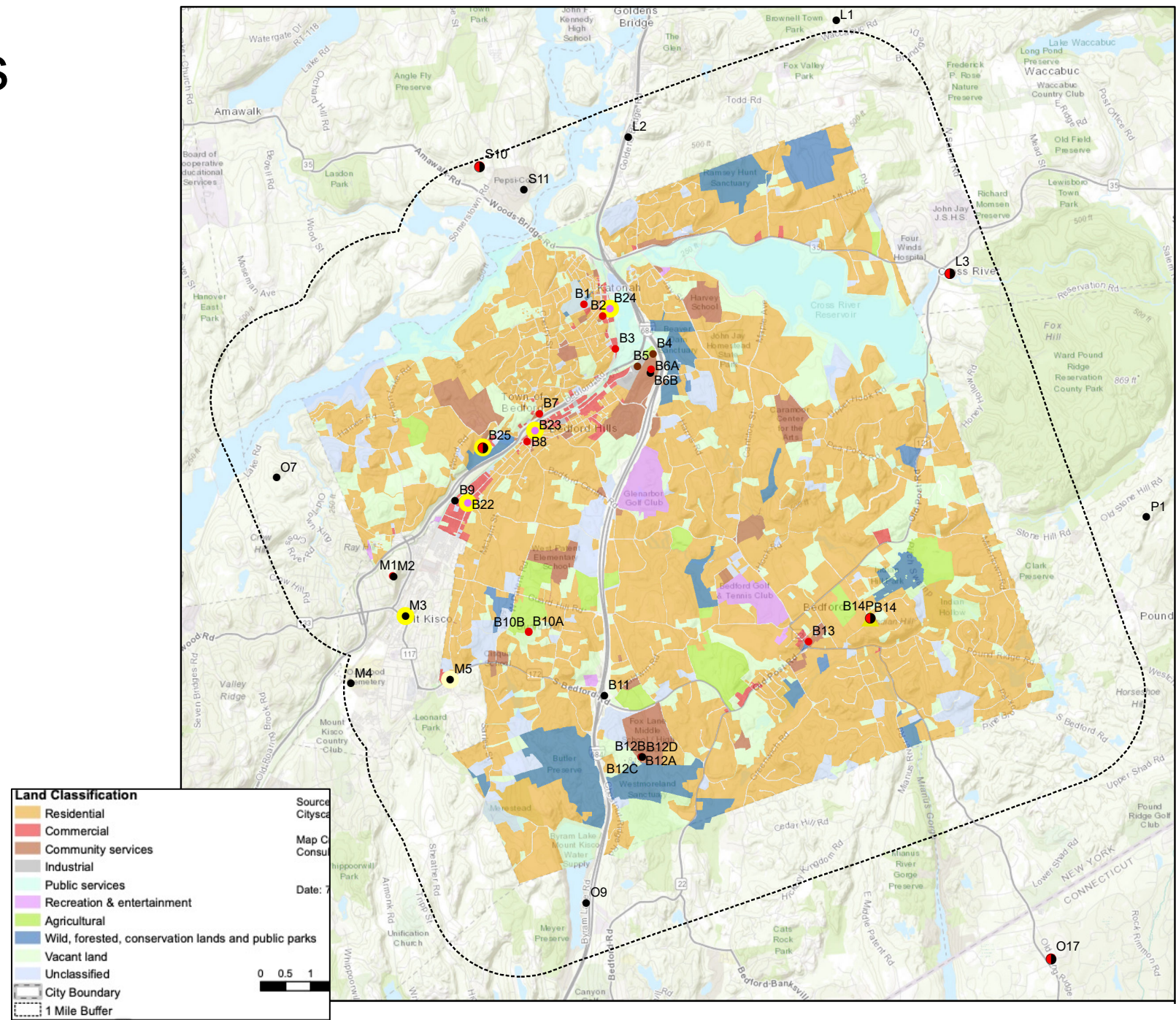
Coverage Gap Analysis

Land Classification

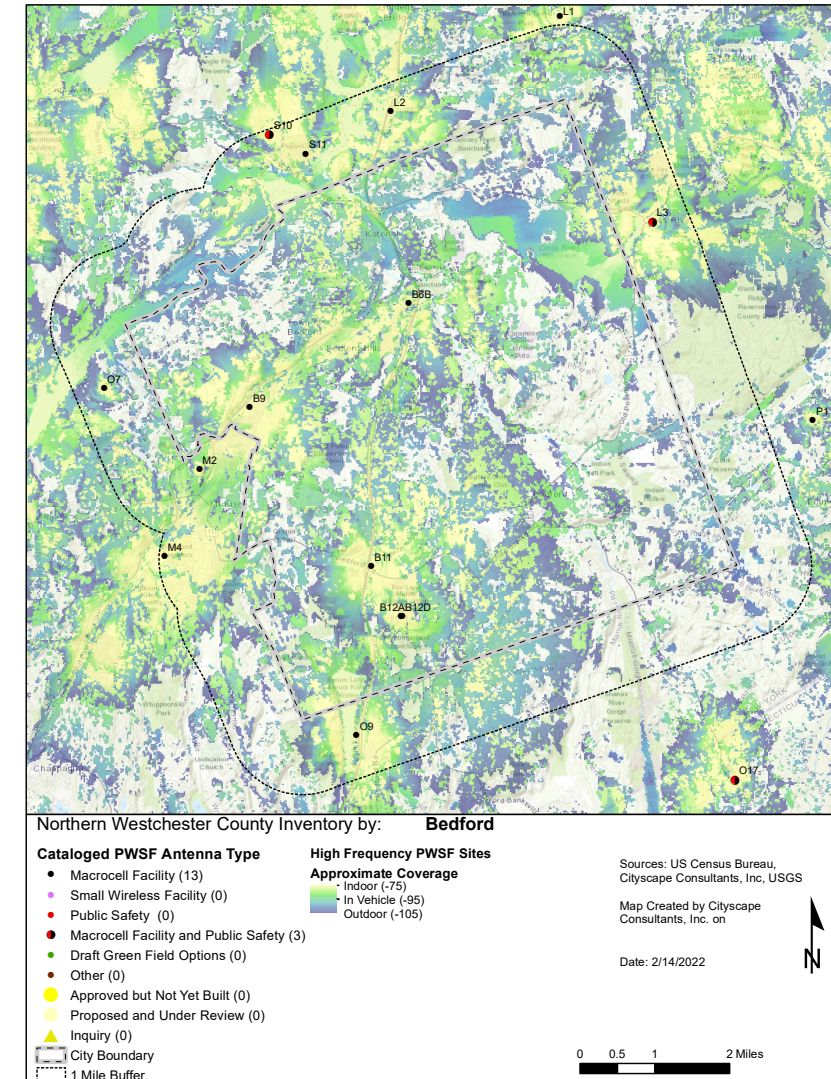
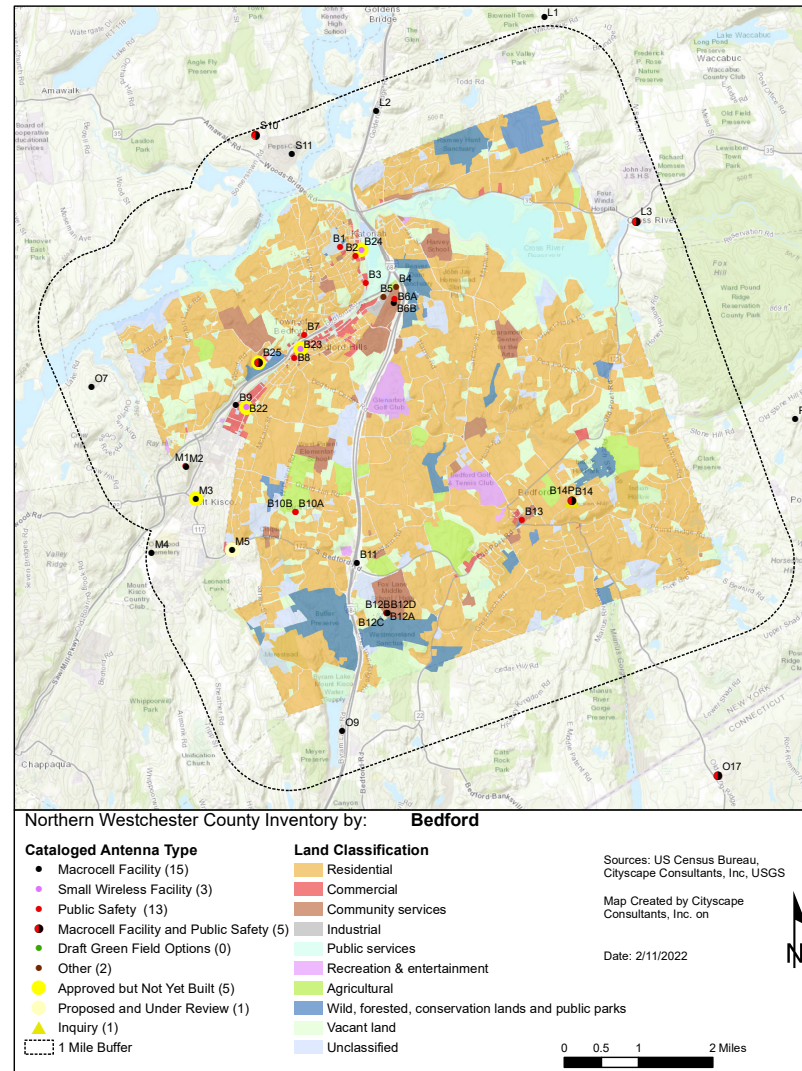
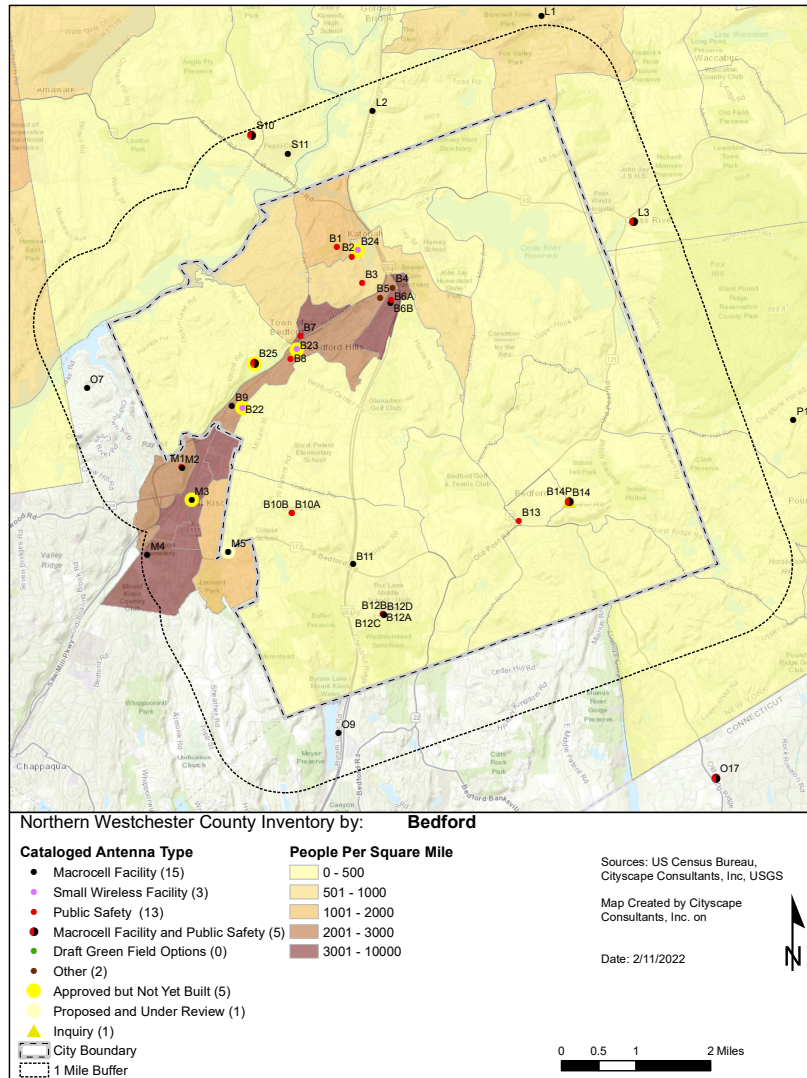
- Bedford largely residential with 4,665 parcels
- Commercial – 266 parcels
 - Bedford Road/Adams Street
 - Old Post Road
- Vacant land – 575 parcels
- Unclassified – 220 parcels

Interstate 684 corridor

South Bedford Road/Old Post Road



Anticipated Gap Fill-in



First Tier Gap Fill In By Providers : Corridors, Higher Density Residential, Commercial, Community Services

Network Capacity for a Single Provider

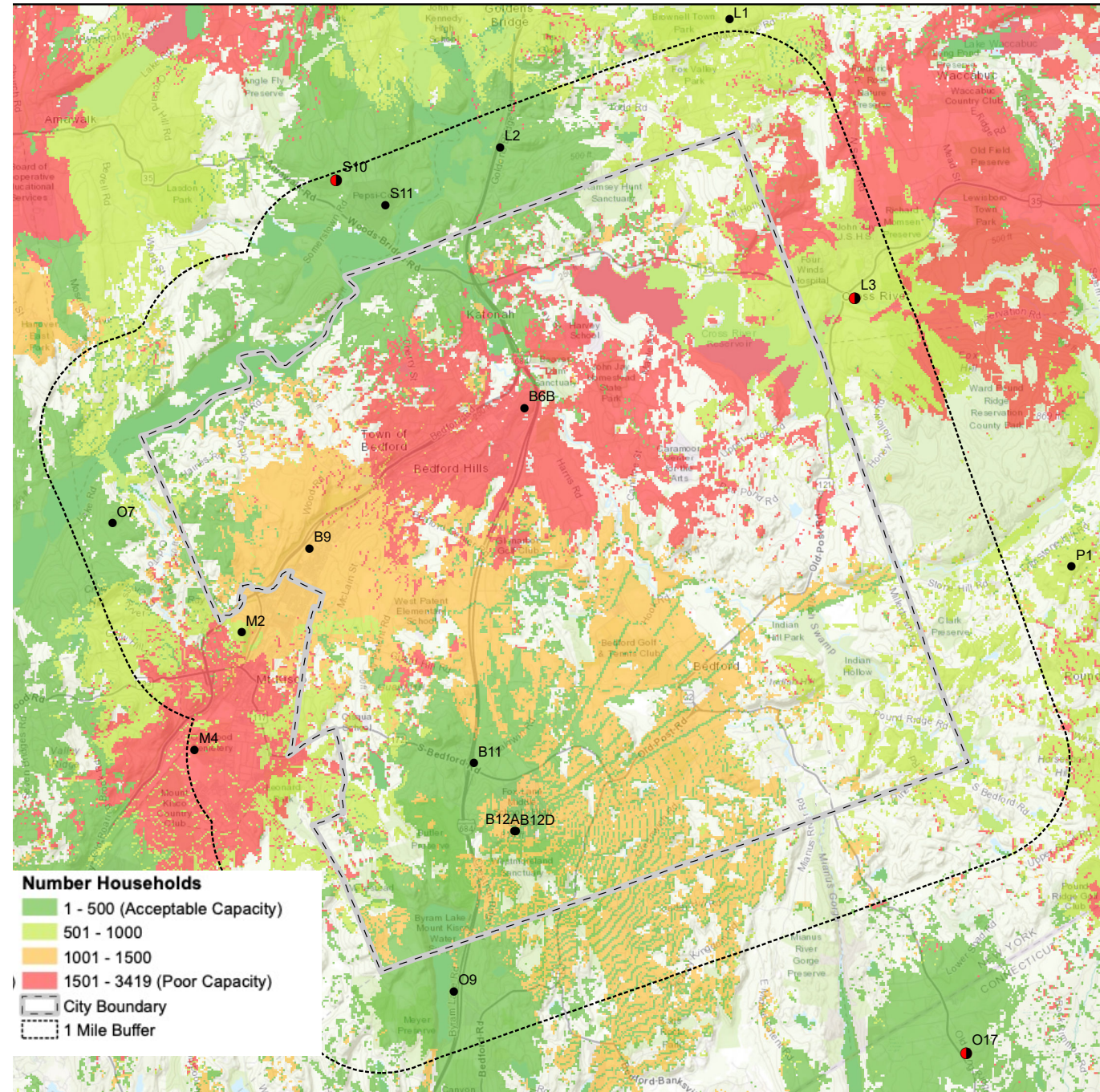
- Simulates areas with potential capacity problems
- Level of propagation signal strength is shown through the gradations of colors from green to red
- Areas with no coloration have no coverage so need for capacity does not show up

→ **Green** – good; ratio of number of sites supporting subscriber base

→ **Orange** – average; ratio of number of sites to subscriber base is problematic

→ **Red** – poor; ratio of number of sites to subscriber base is poor

→ **No color** – none; PWSF sites are needed in most of these areas



Community Poll

Bedford Wireless Infrastructure
Preference Poll

